APPENDIX B
NOISE ANALYSIS TECHNICAL REPORT

This appendix provides detailed information related to the noise results disclosed in **Chapter 4, Environmental Consequences**, the methodology used in preparing the noise analysis, statistical information used in the development of the predicted noise levels, and information related to the impact of noise on people located within the Study Area.

B.1 METHOD OVERVIEW

The sound generated by aircraft is often the most noticeable environmental effect associated with aviation projects. If this sound is sufficiently loud or frequent in occurrence, it may interfere with various human activities or be considered objectionable (noise).

B.1.1 Understanding Noise and it's Measurement

Sound is a complex vibration transmitted through the air which, upon reaching our ears, may be perceived as desirable or unwanted. It is this unwanted sound which people normally refer to as noise." "Aircraft noise" is unwanted sound caused by aircraft overflights and/or aircraft engines running on the ground. Noise and sound are thus physically the same, the difference being in the subjective opinion of the receiver.

Sound can be defined in terms of three components:

1. Loudness (amplitude)
2. Pitch (frequency)
3. Duration (time pattern)

While the pitch and duration of a sound are readily understood, the loudness and its measure are often found to be confusing. The most common measuring unit of sound pressure is the decibel (dB). The human ear has an extremely wide range of response to sound amplitude and because the waves of sound typically heard by the human ear may vary through a wide range from 1 to 100 trillion units (bels), a logarithmic scale (decibels) is used to compress the scale to make the number more manageable. Thus, the decibel scale allows people to describe loudness using numbers ranging zero to about 140. Most everyday sounds range from zero to 120 dB.

The use of the logarithmic decibel scale requires different arithmetic than used with linear scales. The sound pressures of two separate sounds are not directly arithmetically additive. For example, if a sound of 80 dB is added to another sound of 74 dB, the total is a one decibel increase to 81 dB, not an addition to 154. If two equally loud noise events occur simultaneously, the sound pressure level from the combined events is only 3 dB higher than the level produced by either event alone. The key result of logarithmic addition is the greater weight it gives to the higher noise levels compared to quieter levels. Similarly, logarithmic math also returns counterintuitive results when averaging sound levels. Again, the loudest sound levels are the dominant influence in the averaging process. For example, two sound levels of equal duration are averaged. One is 100 dB, the other 50 dB. Using linear arithmetic, the result would be 75. The logarithmic result for decibels is 97 dB because 100 dB contains 100,000 times the sound energy as 50 dB.

In terms of human perception, a 10 dB increase in sound energy over a given frequency is perceived as a doubling of loudness, while a 10 dB decrease seems only half as loud. Thus, a three dB increase in loudness, which is equivalent to a doubling of sound energy, is detected by the ear as a barley perceptible increase in loudness in an outdoor environment.

Based on the key noise components (loudness, pitch, and duration), five common noise descriptors have been developed:

1. 24-Hour Time Above Threshold (TA)
2. Equivalent Sound Level (Leq)
3. Maximum Level (Lmax)
4. Sound Exposure Level (SEL)
5. Day/Night Average Sound Level (DNL)

B.1.2 Guidance and Regulations for Noise Analysis

In order to adequately inform concerned parties and decision makers it is necessary to evaluate the expected noise levels for future conditions. Since future noise levels cannot be directly measured, it is necessary to simulate the expected future condition through noise modeling. Furthermore, noise modeling is the only way that various alternative airspace designs can be compared to one another to identify the relative noise effects for each proposal.

The FAA has developed specific guidance and requirements for the assessment of aircraft noise in order to comply with NEPA requirements. This guidance, specified in FAA Order 1050.1E "Policies and Procedures for Considering Environmental Impacts", requires that aircraft noise be analyzed in terms of the yearly Day-Night Average Sound Level (DNL) metric. In practice, this requirement means that DNL noise levels are computed for the Average Annual Day (AAD) of operations for the year of interest. For this study noise modeling was conducted for the Baseline 2004 (current) conditions, the 2005 future conditions, and the 2010 future conditions.

The DNL metric is a single value of sound level for 24 hour period, which includes all of the time-varying sound energy within the period. To represent the greater annoyance caused by a noise event at night, the DNL metric includes an added 10 dB weighting for nighttime noise events occurring between 10:00 P.M. and 7:00 A.M. (nighttime). This extra nighttime event weighting helps to account for the annoyance of noise during time periods when people are trying to sleep and background noise levels are lower. The weighting, in essence, equates one night flight to ten day flights.

In addition to requiring the use of the DNL metric, the FAA also requires that aircraft noise be evaluated using one of several authorized computer noise prediction models. For this study, the FAA's long standing Integrated Noise Model (INM) was used to develop the noise analysis.

B.2 NOISE MEASUREMENTS

A sampling of field noise measurements was also included as part of this SEA effort. Although the FAA guidelines require that the evaluation of aircraft noise be conducted based on approved computer noise model calculations, it can be helpful to consider the noise modeling results in the context of the local background noise environment. FAA's Order 1050.1E specifically addresses the use of noise measurement data as follows:

> "Noise monitoring data may be included in an EA or EIS at the discretion of the responsible FAA official. Noise monitoring is not required and should not be used to calibrate the noise model."

While it is clearly not appropriate to use noise measurement data for computer model calibration, field noise measurements do allow for the consideration of other aviation activity (for example, VFR flights) that cannot reasonably be modeled. In order to provide the background noise context and the consideration of all aviation activity, a field noise measurement program was conducted at select sites throughout the Study Area.

The primary focus of the measurement program was to collect and calculate a sample of background noise levels at each specific site. The noise measurements contain all noise recorded at a site including aircraft and non-aircraft events. The findings provide context to background and cumulative noise levels so that any changes in modeled noise exposure resulting from an airspace alteration can be considered. The measurement samples also afford a supplemental method to noise modeling that considers all aircraft traffic (including both VFR and IFR traffic). Thus, stake holders, FAA decision makers, and the general public have a context to consider the relevant contributions of project-related noise exposure in relation to noise produced without project-related changes.

B.2.1 Purpose

Average background noise levels (Leq) were measured at 10 specific locations in the region. These background noise measurements contain all noise recorded at the site, both aircraft and non-aircraft related, which was not attributable to flights which were modeled in the INM analysis. For instance, flights from Nellis AFB (LSV) are included in the background noise level analysis, but flights from McCarran airport (LAS) are not because LAS traffic is included in the noise modeling. The measured background levels provide the background or baseline noise levels by which any increases in noise exposure resulting from the Proposed Action can be assessed. The average background noise levels are described using the Leq noise metric, which is a cumulative noise measurement representing the average noise energy over a given period of time. For example, if measurements are recorded for one hour and then averaged together, the resulting number would represent a one-hour Leq. Unlike DNL, no penalty is applied against noise events occurring during the nighttime hours.

B.2.2 Data Collection

The noise measurement program was began September 19 and ended September 23 of 2005. Noise was measured at 8 sites for continuous periods of 4 hours. Measurements at all 8 sites were conducted with a Larson-Davis Model 824 noise monitor. This monitor is a highly sensitive and precise scientific instrument that meets American National Standards Institute (ANSI) S1.4-1983 standards for Type 1 sound level meters. The monitor was programmed to record Leq one-second time-histories in A-weighted decibels. In addition to noise level measurement, qualitative observations were made at all 8 sites. Observations involved logging aircraft and non-aircraft events that were audible. The observer logged the time in hours, minutes and seconds when each event started and ended. If aircraft events were detected, the observer attempted to visually site the aircraft and provided any characteristics of the aircraft event (i.e. aircraft type, operation mode, direction of flight, source airport, etc.). In addition the observer noted the estimated range of ambient noise levels based on the readings of the noise monitor unit during very quiet periods.

In addition to the 8 sites measured in September of 2005, two sites that were part of a measurement program conducted by Brown-Buntin Associates in the summer of 2005 are also included in the analysis. These two sites were monitored continuously for 14 day periods with similar noise measurement equipment. This measurement program did not include field observations made during the measurement period. Consequently, there are no observed ambient noise ranges to report at these sites.

B.2.3 Measurement Sites

Exhibit B.1 illustrates the locations of the ten sites on a map of the area. Brief descriptions of the measurement sites follow.

Site 1 (S1): Freedom Park - Noise was measured on Monday September 19, 2005 between 2:35 and 6:20 PM. Freedom Park was located north of a water treatment plant which created some low level mechanical noise from generators and other equipment. There was minimal auto traffic on the park roadways, and occasional pedestrian traffic. The weather was sunny with a light southerly wind. Ambient noise levels were estimated to be between 49.0 and 50.5 dBA by the observer.

Site 2 (S2): Jaycee Park - Noise was measured on Tuesday September 20, 2005 between 8:30 AM and 12:30 PM. Jaycee Park received background noise from auto traffic on adjacent Sahara Ave and Eastern Ave. There was light pedestrian traffic in and around the park. Weather was windy with gusts from the west and occasional rain. Ambient noise levels estimated by the observer were between 55.0 and 56.8 dBA.

Site 3 (S3): Baker Park - Noise was measured Tuesday September 20, 2005 between 1:00 and 5:00 PM. Baker Park received light constant auto traffic noise from Sahara Ave to the south. There was occasional automobile traffic in the parking lot near the site. Weather consisted of constant rain and gusty winds with a temperature around 75° F. Ambient noise levels were estimated by the observer to be between 52.0 and 54.0 dBA.

Site 4 (S4): Desert Breeze Park - Noise was measured Wednesday September 21, 2005 between 8:00 AM and 12:00 PM. Desert Breeze Park had comparably few sources and low levels of background noise. Sources noted were maintenance vehicles for the park and light auto traffic on Kid Zone Pkwy to the south and east. Weather was sunny and 90° F with light wind. Ambient noise levels were observed to be between 43.0 and 46.0 dBA.

Site 5 (S5): Rainbow Family Park - Noise was measured on Wednesday September 21, 2005 between 1:00 and 5:00 PM. The only source of background noise noted was a constant low level auto traffic noise from Oakley Blvd to the north. Weather was sunny and 90° F with light wind. Ambient noise levels estimated by the observer were between 41.1 and 45.0 dBA.

Site 6 (S6): Ansan Park - Noise was measured on Thursday September 22, 2005 between 10:00 AM and 2:00 PM. Ducharme Ave to the north was noted as the major contributor to background noise. Ducharme Ave was close to the site with occasionally steady traffic. An air conditioning unit across the street and people occasionally making noise in the park were also noted as background sources. Weather was sunny and 91° F with light wind. Ambient noise levels were noted to be between 41.0 and 44.0 dBA by the observer.

Site 7 (S7): Cragin Park - Noise was measured on Thursday September 22, 2005 between 2:45 and 6:45 PM. The only source of background noise noted during measurement was a light constant auto traffic noise from Charleston Blvd to the south. Weather was sunny, 91° F with a light wind. Ambient noise levels observed to be between 46.0 and 48.0 dBA.

Site 8 (S8): Shadow Rock Park - Noise was measured on Friday September 23, 2005 between 9:45 AM and 1:45 PM. The site was noted to be relatively quiet with occasional auto traffic on the gravel road traveling to a nearby dog park. Also a nearby gun range may have lead to sporadic sharp spikes in the noise data. This site received heavy military air traffic from Nellis AFB. There was also distant construction noise to the north of the site. Weather was sunny, 91° F with a light gusty wind. Ambient noise levels were noted to be between 41.0 and 45.0 dBA by the observer.

Site M6: Sierra Vista High School – Noise was measured between Wednesday July 13, 2005 and Tuesday July 26, 2005 as part of the aircraft noise monitoring program performed by Brown-Buntin Associates in the summer of 2005. The monitor was placed on the roof of the main classroom building. The site was exposed to noise from departues on LAS Runways 25L and 25R after such departures turned south from the runway heading.

Site M7: 7428 Comanche Canyon – Noise was measured between Wednesday July 13, 2005 and Tuesday July 26, 2005 as part of the aircraft noise monitoring program performed by Brown-Buntin Associates in the summer of 2005. The site was located near the extended centerline of LAS Runway 01L-19R and was exposed to noise from arrivals on Runways 01L and 01R and departures on 19L and 19R.

B.2.4 Measurement Results

Table B.1 provides a summary of the measured background noise exposure as defined by the Leq metric. Leq is a cumulative noise metric representing the average noise energy over a given period of time. In each case the time period is the defined as the entire period of measurement for the given site. Measured background noise includes all recorded noise during the measurement period, except when a noise event was deemed attributable to the LAS airport. These noise levels were mathematically removed from the noise data so that a background Leq could be computed with out the LAS aircraft noise. The reason that flights attributable to LAS are not included is that all LAS air traffic is included in the noise modeling, while the purpose of the measurement program is to quantify the background noise not included in the noise modeling.

Table B.1
MEASURED BACKGROUND LEQ VALUES

Site	Description	Date Time	Measured Background Leq (dBA)
1	Freedom Park	9/19/05 14:35 - 18:20	51.2
2	Jaycee Park	9/20/05 8:30 - 12:30	58.1
3	Baker Park	9/20/05 13:00 - 17:00	53.3
4	Desert Breeze Park	9/21/05 8:00 - 12:00	52.7
5	Rainbow Family Park	9/21/05 13:00 - 17:00	48.6
6	Ansan Park	9/22/05 10:00 - 14:00	49.4
7	Cragin Park	9/22/05 14:45 - 18:45	51.0
8	Shadow Rock Park	9/23/05 9:45 - 13:45	62.8
M6	Sierra Vista High School	7/13-26/05	59.5*
M7	7428 Comanche Canyon	7/13-26/05	60.0*

Source: Landrum & Brown Analysis, 2005
* These values are DNL for the time periods measured as Leq was not available.

It should be noted that these background noise values are different than the range of ambient noise casually observed by field technicians during quiet periods. The calculated background noise levels include all noise sources except LAS aircraft noise and do not necessarily represent the "quiet" periods that define the ambient observations reported for each site.

B.3 NOISE MODELING AND ANALYSIS

This section of the report describes the model used in the analysis, the data required for input into the model, noise model development procedures used, and the outputs from the modeling process.

B.3.1 Noise Model Program

A computer model is used to determine the noise exposure patterns related to aircraft operations in the airport environs. The use of a computerized overflight noise prediction model is necessary because noise impacts on humans are generally more closely correlated with prevailing long-term noise conditions than with occasional events and seasonal fluctuations. To attempt to measure prevailing noise levels directly would require months of measurement at numerous noise monitor sites -- an impractical, more expensive and potentially less accurate method of determination, particularly when estimating noise levels that will not occur for several years into the future.

The current version of the FAA's Integrated Noise Model (INM) Version 6.1 was used in this study. The INM is specified by the FAA for the prediction of aircraft noise at civilian airports. It is a computer model which, during an average 24-hour period at an airport, accounts for each aircraft flight along flight paths leading to or from the facility, or overflying it. Flight path definitions are coupled with separate tables in the program database relating to noise levels at varying distances and engine power settings for each distinct type of aircraft selected. The following paragraphs describe how the model computes noise contours.

At regular grid locations on ground level around the airport, the distance to each aircraft in flight is computed, and the associated noise exposure of each aircraft flying along each flight path within the vicinity of the grid location is determined. Additional corrections are applied for excess air-to-ground attenuation, acoustical shielding of aircraft engines by the aircraft body, speed variations, and atmospheric absorption. The logarithmic acoustical energy levels for each individual aircraft are then summed for each grid location. For the DNL metric, a penalty for nighttime operations is applied. The cumulative values of noise exposure at each grid location are then used to interpolate contours of equal noise exposure for reference DNL levels (i.e., 60 DNL, 65 DNL, etc.). For this study, contour analysis will be used to describe DNL dispersion patterns in excess of 60 DNL.

For grid analyses, the model computes the acoustic data only at locations selected by the user (at grid points). Data on acoustic energy and peak noise levels requested by the user are computed for each aircraft overflight in the vicinity of the grid point. This data is reported for each desired metric. For this study, grid point noise level data include DNL and Time Above 65 dBA levels for the average annual day.

To activate the INM, a variety of user-supplied input data is required. These include a mathematical definition of the airport runways relative to a base reference point, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types to individual flight paths from each runway end. Optionally, the user may adjust standard database information to reflect the vertical profiles used by aircraft as they fly to or from the airport(s) through the adjacent airspace or may modify the default noise-power-distance curves in the model. The following sections provide a discussion of the input data used to prepare the noise exposure contours and grid point data for the study.

B.3.2 Noise Model Input

A variety of user-supplied information is required to accurately run the Integrated Noise Model (INM) to compute aircraft noise levels in the airport environs and along the routes of flight leading to and from the airport. In the case of this project, noise levels were computed for operations associated with only McCarran International Airport.

McCarran International Airport handled in excess of 542,000 operations in 2004, including a mixture of domestic and international passenger traffic, cargo operations, and substantial general aviation activity.[1]

The INM requires that airport runways and flight tracks be defined through a system of geographic coordinates, and that the volume of traffic using the airport be distributed among them. This distribution is divided among numerous aircraft types and the time of day at which they operate.

For this analysis, input data was developed from three sources.

1. Forecast information supplied by Clark County Aviation Department for year 2004, 2005, and 2010 operations.
2. Fleet Mix information supplied by Clark County Aviation Department for year 2004, 2005, and 2010 operations.
3. Runway Use information supplied by Clark County Aviation Department for 2004.
4. Radar Data provided by FAA's Air Traffic (AT) Labs.

A sample of radar data for traffic at LAS was taken from FAA's AT Labs archive. The sample included 15 days of traffic at LAS from 2004 and 2005. The sample days were spread from mid-2004 to April of 2005 to accommodate seasonal variations and to capture the most recent flight routings. The data included some 20,994 flight tracks that were used to develop modeled flight tracks and day-night distributions. Details of the input data to INM for this project are discussed below.

B.3.2.1 Local Environmental Variables

In order to calculate noise levels specific to the conditions in the area of investigation, the INM model utilizes several local environmental variables. These include temperature, atmospheric pressure, humidity, airport average headwind, airport elevation, and terrain.

For this analysis, 30 years (1971-2000) of weather observations collected at LAS were used to determine the long-term average weather conditions in the Las Vegas area. **Table B.2** summarizes the weather data used for the NIRS analysis.

[1] Clark County Department of Aviation, 2005

Table B.2
ENVIRONMENTAL VARIABLES – WEATHER

Variable	Annual Average
Temperature (degrees Fahrenheit)	68.1
Relative Humidity (percentage)	31.5
Headwind (knots)	8

Source: National Climatic Data Center (NCDC) Comparative Climatic data collected at Las Vegas McCarran International Airport, 1971-2000.

The airport elevation for LAS at 2,181' MSL was selected as the INM study elevation for the analysis. Detailed terrain data for the entire Study Area was incorporated from the United States Geological Survey (USGS) 1 degree Digital Elevation Model (DEM) database for the US. This database provides elevation data at ground points separated by 3 arc-seconds (approximately 250' east-west and 300' north-south in the LAS area). The elevation values for each point are provided at a 1-meter resolution.

B.3.2.2 Operations Levels

For this analysis, the number of daily operations for the year 2004 and forecast years 2005 and 2010 were derived from the Clark County Department of Airports forecasts provided in September of 2005. The forecast information includes total average daily operations, distributed among general categories of user and detailed fleet mix.

The average number of daily operations was derived by dividing the annual operations, as reported in the forecasts, by 365. **Table B.3** provides a summary of the annual and annual average daily operations used in this assessment to project noise levels for each facility in the years 2004, 2005, and 2010.

The computations indicate that McCarran International Airport experienced an estimated average of 743 operations each day during 2004. In the year 2005, the total number of operations is forecast to grow by approximately 2% to exceed 553,000 annual operations or 758 on an annual average day. By 2010 operations are expected to grow some 13.5% over the 2005 levels with some 628,000 annual operations or approximately 860 on an annual average day.

Table B.3
CURRENT and FORECAST ANNUAL OPERATIONS

Facility	Annual Operations			Operations Per Annual Average Day		
	2004	2005	2010	2004	2005	2010
McCarran International Airport	542,217	553,188	628,008	742.80	757.82	860.31

Source: Clark County Department of Aviation, September 2005

B.3.2.3 Day/Night Distribution

The time of day that operations occur is also a key component of the INM input. It is important to the computation of the cumulative average noise level because a penalty of ten decibels is assigned to each operation that occurs between the hours of 10 p.m. and 6:59 a.m. The distribution between day and night was developed for each individual aircraft type and operation type form the LAS radar sample acquired for this analysis. On an average day in 2004, approximately 15% of aviation traffic operating at LAS takes place during the night hours (10 p.m. to 6:59 a.m.). The Day Night splits developed from the radar data sample were used for the current 2004 conditions as well as the future 2005 and 2010 conditions. **Table B.4** presents the Day-Night percentages used for noise modeling for each aircraft type in the LAS fleet.

Table B.4
DAY-NIGHT PERCENTAGES BY AIRCRAFT TYPE

INM Type	Typical Aircraft	ARRIVALS		DEPARTURES	
Scheduled Air Carrier and Commuter		**Day %**	**Ngt %**	**Day %**	**Ngt %**
Heavy (more than 200 seats)					
747400	Boeing 747 all series	100.0%	0.0%	100.0%	0.0%
767300	Boeing 767 all series	84.6%	15.4%	80.5%	19.5%
777300	Boeing 777 all series	84.6%	15.4%	80.5%	19.5%
777200	Boeing 7E7, 787	84.6%	15.4%	80.5%	19.5%
A310	Airbus A310 all series, A300's, A330's, A340's	43.8%	56.3%	89.2%	10.8%
DC1030	McDonnell Douglas DC-10's, MD11's, and L1011's	71.4%	28.6%	100.0%	0.0%
Medium (150 Seats to 200 Seats)					
737800	Boeing 737-800/900's	73.8%	26.2%	75.7%	24.3%
727EM2	Boeing 727's all series w/Hushkits	79.2%	20.8%	86.9%	13.1%
757RR	Boeing 757's all series	74.5%	25.5%	72.4%	27.6%
A320	Airbus A320 & A321's	69.0%	31.0%	69.9%	30.1%
MD9028	McDonnell Douglas MD-90's all series	87.1%	12.9%	87.1%	12.9%
Small (50-149 seats)					
737300	Boeing 737-300's	85.3%	14.7%	86.3%	13.7%
737400	Boeing 737-400's	64.2%	35.8%	82.5%	17.5%
737500	Boeing 737-500's	92.8%	7.2%	92.9%	7.1%
737700	Boeing 737-700's	87.4%	12.6%	88.2%	11.8%
717200	Boeing 717's	80.7%	19.3%	82.9%	17.1%
737N17	Boeing 737-100/200's w/Hushkits	91.4%	8.6%	79.8%	20.2%
A319	Airbus A318 & A319's	63.7%	36.3%	63.8%	36.2%
DC93LW	McDonnell Douglas DC-9's all series w/Hushkits	78.6%	21.4%	100.0%	0.0%
GV	CR7, CR9, E170, E190	59.8%	40.2%	53.4%	46.6%
MD83	McDonnell Douglas MD-80's all series	80.7%	19.3%	82.9%	17.1%
Commuter (Less than 50 seats)					
DHC6	Large Twin Turboprops	100.0%	0.0%	100.0%	0.0%
EMB120	Embraer 120's	100.0%	0.0%	100.0%	0.0%
EMB145	CRJ-200, E135, E145	46.2%	53.8%	100.0%	0.0%
Helicopters					
AS350	Helicopters (Strip + Canyon)	100.0%	0.0%	100.0%	0.0%
General Aviation & Military					
BEC58P	Twin Piston Prop (Beech Baron)	90.9%	9.1%	87.1%	12.9%
CNA441	Twin Turboprop (King Air)	93.6%	6.4%	91.2%	8.8%
LEAR25	Med./Sm. Stage 2 Bizjet (LR24, LR25)	92.2%	7.8%	92.0%	8.0%
F-18	Military Jets (F18, F16)	100.0%	0.0%	100.0%	0.0%
GASEPV	Single Engine Prop (C172)	98.5%	1.5%	96.2%	3.8%
GIIB	Large Stage 2 Bizjet (GII, GIII, Sabr)	86.6%	13.4%	87.3%	12.7%
GIV	Large Stage 3 Bizjet (GV)	91.9%	8.1%	86.8%	13.2%
LEAR35	Med./Sm. Stage 3 Bizjet (LR35)	92.0%	8.0%	93.1%	6.9%

Sources: Clark County Department of Aviation, September 2005. Landrum & Brown Analysis, 2005.

B.3.2.4 Runway Use

The runway use percentages define which runways are to be used for arrivals and departures on an average annual basis. Generally, the primary factor determining runway use at an airport is the weather, aircraft type, and prevailing wind conditions at the time of a flight. Additionally, several other key factors also have a strong influence on runway selection. These factors include: taxiing aircraft crossing active runways or Land and Hold Short (LAHSO) rules, the current make up of the traffic (many arrivals or many departures), and even the flight's origin or destination.

The distribution of traffic among the runways at LAS was provided by the Clark County Department of Aviation and was based on a detailed study of 2004 operations at LAS. The runway use proportions information provided by the CCDOA was assumed to be representative of the annualized condition for both the No Action and Proposed Action conditions in the existing and future time frames. Use of individual runways, as drawn from analysis is presented in **Table B.5**. Runway usage would not be changed due to the Proposed Action. Therefore, the runway use percentages shown on **Table B.5** are representative of both the Proposed Action and the No Action.

Table B.5
RUNWAY USAGE

Aircraft Group	Runway	Departures		Arrivals	
		Day	Night	Day	Night
Jets	19L	23.6%	7.8%	8.1%	15.6%
	19R	1.3%	0.8%	4.3%	3.0%
	1L	1.6%	1.1%	6.8%	4.0%
	1R	10.5%	7.3%	5.6%	3.1%
	25L	0.4%	1.0%	72.0%	67.3%
	25R	53.9%	80.6%	1.1%	6.5%
	7L	8.6%	1.4%	0.0%	0.1%
	7R	0.1%	0.0%	1.9%	0.4%
	Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**
General Aviation / Other	19L	34.0%	18.8%	5.8%	8.0%
	19R	30.4%	41.8%	61.0%	53.4%
	1L	9.6%	5.7%	13.8%	9.2%
	1R	5.9%	3.4%	1.8%	2.4%
	25L	1.8%	4.5%	15.5%	12.5%
	25R	9.8%	21.7%	0.6%	12.8%
	7L	7.8%	3.9%	0.4%	1.3%
	7R	0.6%	0.2%	1.0%	0.4%
	Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Day = 7:00 a.m. to 9:59 p.m.
Night = 10:00 p.m. to 6:59 a.m.

B.3.2.5 Aircraft Fleet Mix

The distribution of the operations among the many types of aircraft available within the INM is another important component of the INM input data. The distribution among types for this analysis was based on the distribution of aircraft provided by the Clark County Department of Aviation forecasts discussed above. The average daily operations by aircraft type for LAS is presented in **Table B.6**.

B.3.2.6 Aircraft Climb / Descent Profiles

An optional element of the INM provides the ability to define descent profiles representative of the proposed procedures and is a fifth critical component of the input. For high altitude noise assessments, arrival and departure procedures are evaluated to an altitude of 10,000 feet above the airport field elevation (AFE). For the purposes of INM modeling, AFE is used to assess the relationship between aircraft altitude and the airport field elevation. The INM also takes into account terrain data to calculate the altitude of the aircraft above the ground. For the purpose of presenting altitudes in this SEA, the Proposed Action and No Action Alternatives reflect Above Ground Level (AGL) elevations for all exhibits and tables.

In each case, the evaluation is tempered by the requirement that the cumulative annual average noise level under these flight paths must exceed 45 decibels of DNL and that the increase from baseline conditions must exceed 5 dB if between 45 and 60 DNL; 3 dB if between 60 and 65 DNL; and 1.5 dB if the noise level of the proposed condition is greater than 65 DNL. The default approach profile associated with the INM calls for a three degree descent from 6,000 feet AFE. Beyond that point, the model assumes a continuation of the descent below 6,000 feet AFE. For this analysis, the approach profiles for each modeled aircraft were extended along the INM's standard 3° approach profile to 10,000 feet AFE.

Similarly, revisions to departure procedures are to be evaluated to an altitude of 10,000 feet AFE, tempered by the provision that they are notable if they result in an increase in DNL as described in the previous paragraph. The default profiles for the various aircraft expected to use LAS result in attainment of 10,000 feet AFE at distances from the airport ranging from 13 to 30 miles along the route of flight. The aircraft that are associated with the slowest climbs are those that are the largest and heaviest (B-747, DC-10, etc) bound for destinations more than 1,500 miles from the airport. Small aircraft bound to the same locations typically reach 10,000 feet AFE between 15 and 25 miles along the route of flight. Consequently, the aircraft departing LAS will, on an average day, normally be above 10,000 feet AFE before they reach the first transition fix leading out of the TRACON boundary.

Table B.6
AVERAGE DAILY OPERATIONS BY AIRCRAFT TYPE (FLEET MIX)

INM Type	Typical Aircraft	2004	2005	2010
Scheduled Air Carrier and Commuter				
Heavy (more than 200 seats)				
747400	Boeing 747 all series	2	3	5
767300	Boeing 767 all series	17	18	24
777300	Boeing 777 all series	0	0	2
777200	Boeing 7E7, 787	0	1	4
A310	Airbus A310 all series, A300's, A330's, A340's	5	5	5
DC1030	McDonnell Douglas DC-10's, MD11's, and L1011's	3	3	1
Medium (150 Seats to 200 Seats)				
737800	Boeing 737-800/900's	33	33	36
727EM2	Boeing 727's all series w/Hushkits	12	11	6
757RR	Boeing 757's all series	146	149	166
A320	Airbus A320 & A321's	161	165	190
MD9028	McDonnell Douglas MD-90's all series	6	6	6
Small (50-149 seats)				
737300	Boeing 737-300's	258	265	311
737400	Boeing 737-400's	6	6	3
737500	Boeing 737-500's	17	16	10
737700	Boeing 737-700's	165	173	221
717200	Boeing 717's	4	4	6
737N17	Boeing 737-100/200's w/Hushkits	35	31	11
A319	Airbus A318 & A319's	47	50	69
DC93LW	McDonnell Douglas DC-9's all series w/Hushkits	2	2	3
GV	CR7, CR9, E170, E190	21	24	42
MD83	McDonnell Douglas MD-80's all series	58	58	63
Commuter (Less than 50 seats)				
DHC6	Large Twin Turboprops	0	0	0
EMB120	Embraer 120's	11	11	9
EMB145	CRJ-200, E135, E145	18	18	18
Helicopters				
AS350	Helicopters (Strip + Canyon)	243	244	252
General Aviation & Military				
BEC58P	Twin Piston Prop (Beech Baron)	39	42	62
CNA441	Twin Turboprop (King Air)	13	14	18
LEAR25	Med./Sm. Stage 2 Bizjet (LR24, LR25)	9	10	11
F-18	Military Jets (F18, F16)	1	1	1
GASEPV	Single Engine Prop (C172)	40	42	53
GIIB	Large Stage 2 Bizjet (GII, GIII, Sabr)	8	8	7
GIV	Large Stage 3 Bizjet (GV)	44	43	41
LEAR35	Med./Sm. Stage 3 Bizjet (LR35)	62	63	67
	TOTAL	**1,486**	**1,516**	**1,721**

Sources: Clark County Department of Aviation, September 2005. Landrum & Brown Analysis, 2005

B.3.2.7 Flight Track Definitions

To determine projected noise levels on the ground, it is necessary to determine not only how many aircraft are present, but also where they fly. Therefore, flight route information is a key element of the INM input data. In order to ensure that the noise modeling accurately reflects local conditions in the LAS area it is necessary to develop noise modeling tracks from a sample of detailed radar data.

For this evaluation, flight paths for the No Action and Proposed Action Alternatives were developed from an analysis of the 15-day radar data sample acquired for this study. A well selected (busy days) sample of this size is generally adequate to develop an understanding of the typical flight routs around an airport. Additionally, the 15 days can be spread throughout various seasons to account for the long-term variances associated with wind and weather patterns. For this analysis, the radar sample consisted of the following days: 5/14/04, 5/21/04, 8/11/04, 8/19/04, 10/1/04, 10/15/04, 10/22/04, 10,29/04, 1/2/05, 1/21/05, 3/17/05, 3/18/05, 4/15/05, 4/22/05, and 4/29/05. The sample yielded some 20,000+ individual radar tracks for analysis.

The Airspace Design Tool (ADT) was utilized for the detailed analysis of the radar data for the project. The data was first separated by operation type (arrival, departure). ADT was then used to develop bundles of radar tacks based on runway, aircraft category (jet, prop), and route similarity. Once the radar track bundles were complete, the development of noise modeling input tracks was initiated.

The ADT program allows for the development of primary, or backbone, flight tracks for each radar track bundle. The system also allows for the simultaneous computation of sub-tracks that are located adjacent to the backbone track. These sub-tracks account for the dispersion of actual flights about the primary flight corridor based on the distribution of radar tracks within each bundle. The system uses the statistical distribution of the radar track locations along the backbone track determine the spacing between the sub-tracks at that point. The number of sub-tracks developed is determined by the user dependant on the number of radar tracks in the bundle and their general spread thought the route.

The system also computes a weighting factor for each sub-track that allows aircraft operations to be assigned to the backbone tracks and then automatically distributed to each of the corresponding sub-tracks. This weighting factor is computed based on the average lateral distribution of the radar tracks throughout the bundle with respect to the backbone track position. The resulting distribution generally approximates a “normal", or bell curve, distribution with the highest percentage on the backbone track and progressively lower percentages on the adjacent sub-tracks. The process of the flight track analysis was conducted for each airport and operation type in each direction of flow.

The radar data analysis resulted in the development of some 60 individual backbone departure tracks with 170 associated sub-tracks. Thus, some 230 unique departure tracks were developed for INM input. **Exhibit B.2** presents an overview of the INM departure tracks used in the modeling of the 2004 Baseline condition and compares them to the radar tracks used in their development. The thick green lines represent the backbone tracks with the lighter and thinner green tracks indicating the sub tracks. When compared to the radar tracks shown in light red, it is evident that the resulting INM tracks provide a good representation of the typical flight routes in the Las Vegas area.

Similarly, the radar data analysis resulted in the development of some 45 individual backbone arrival tracks with 89 associated sub-tracks. As a result, some 134 unique arrival tracks were developed for INM input. **Exhibit B.3** presents the resulting INM arrival tracks used in the modeling of the 2004 Baseline condition. The thick dark brown lines represent the backbone tracks with the thinner lighter brown tracks accounting for the sub tracks. Again, the comparison against the radar arrival tracks shown in light green indicates that the modeled tracks provide a good representation of the arrival patterns in the area.

The procedure evaluated by this SEA is an RNAV procedure and is expected to be used by approximately 95% of the active jet fleet at LAS. **Exhibit B.4** depicts the existing and proposed arrival flight tracks used for the INM modeling of the No Action and Proposed Action conditions. Note that the arrival tracks remain the same for the No Action and Proposed Action scenarios, thus only one color of arrival tracks is shown on the exhibit. Similarly, **Exhibit B.5** depicts the departure flight tracks used for the INM modeling of the No Action and Proposed Action conditions. In this case, the exhibit illustrates two colors of departure tracks. The green tracks represent the No Action departure tracks while the gold tracks represent the Proposed Action tracks. Note that many of the departure routes remain the same for both scenarios, thus only one color is evident for many routes.

B.3.2.8 Flight Track Assignment

The final step in developing the flight track input data for the INM is the assignment of aircraft to specific flight tracks. The radar data sample acquired for the flight track analysis was used as a basis for this analysis. The flight data associated with the bundle of radar data used to make the INM backbone track was retained as an attribute of each backbone track. This data included aircraft type, time-of-day (day or night), and flight origin or destination.

The distribution of traffic among the modeled flight tracks developed from the radar data analysis was based on the distribution of flights in the radar data for the current Baseline and future No Action conditions. The modeled flight tracks for the Proposed Action Alternative were similarly developed through the definition of routes of proposed STAAV3 departure procedure and were dispersed to reflect corridor widths comparable to those associated with current procedures.

B.3.3 Assessing the Impact of Noise

The FAA has considered the matter of threshold levels above which aircraft noise causes an adverse impact on people and has established 65 DNL as the threshold above which aircraft noise is considered incompatible with residential areas. In addition, the FAA has determined that a significant impact occurs if a proposed action would result in an increase of 1.5 DNL or more on any noise-sensitive area within the 65 DNL exposure level.[2,3,4]

In 1992, the Federal Interagency Committee on Noise (FICON) recommended that noise increases of 3 dB or more between DNL 60 and 65 dB be evaluated in environmental studies when increases of 1.5 DNL or more occur at noise-sensitive locations at or above 65 DNL. Increases of this magnitude below 65 DNL are not to be considered as *significant impacts*, but they are to receive consideration. The FAA adopted FICON's recommendation into FAA Order 1050.1E.

In 1990, the FAA issued a noise screening procedure for determining whether certain airspace actions above 3,000 feet above ground level (AGL) might increase DNL levels by five decibels or more.[5] The procedure served as a response to FAA experience that increases in noise of 5 dB or more at cumulative levels well below 65 DNL could be disturbing to people and become a source of public concern. In past air traffic environmental evaluations, the FAA has evaluated noise levels down to the 45 DNL level for potential increases in DNL noise exposure of 5 dB or more. The FAA formalized the use of this threshold of change in the recent release of FAA Order 1050.1E. The criteria for assessing increased noise exposure are described below:

- 1.5 dB or more increase within the area exposed to an average annual dB of 65 decibels or more by the proposed project (an environmentally significant increase).[6] NEPA guidance states that an increase of 1.5 dB within an area of 65 DNL is considered a significant impact and therefore this analysis is required to determine if significant noise impacts result from the Proposed Action.
- 3.0 dB or more increase within the area exposed to an average annual dB of between 60 and 65 decibels by the proposed project (a reportable increase). This marginal impact area is based on guidance provided by the Federal Interagency Committee on Noise (FICON), which is used to identify noise impacts outside 65 DNL.

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[2] FAA Order 1050.1E, Appendix A, Section 14, Noise.
[3] FAR Part 150 Section 150.21(a)(2)(d).
[4] FICON 1992, Pp. 3-5.
[5] FAA Notice 7210.360. September 14, 1990.
[6] For environmental evaluations, these areas of reportable difference were developed by applying the Noise Level Difference computation option of the INM. This option subtracts the noise levels computed for the No Action condition from the Proposed Action condition to indicate the change associated with the proposed modification to the baseline condition. This analysis is based on FAA Notice FAA-AEE-99-01.

- 5.0 dB or more increase within the area exposed to an average annual dB of between 45 and 60 decibels by the proposed project (a reportable increase).[9]

Noise exposure contours and areas of increased noise exposure were prepared in accordance with the above criterion in order to determine if potential noise impacts would occur as a result of the Proposed Action.

B.3.3.1 Baseline 2004 Noise Impacts

The baseline 2004 noise conditions were modeled to provide a current point of reference for considering the future noise impacts with and without the project. **Exhibit B.6** displays the noise exposure contours for the 2004 conditions. As shown in **Exhibit B.6**, the current noise pattern around LAS is generally aligned with the runway geometry of the airport. The 60 DNL noise contour extends some five miles to the west of the airport and exhibits a bend to the south due to the predominant use of the left (southerly) turn procedures from Runways 25L and 25R. The noise pattern north of the airport extends about three miles north of the airfield and exhibits a slight bend to the west resulting from the predominance of traffic turning left from Runway 1L and 1R. To the south, the noise pattern generally follows the extended runway centerlines for Runways 19L and 19R and extends some four to five miles south of the airport. The noise pattern east of LAS is dominated by arrival traffic and extends about five miles east of the airport. **Table B.7** presents the number of people within the Study Area and acres within the noise contours for the 2004 Baseline conditions.

Table B.7
NOISE IMPACTS FOR BASELINE 2004

Condition	60 - 65 DNL	65 – 70 DNL	70 - 75 DNL	75+ DNL
Population				
2004 Baseline	37,967	10,121	3,640	2,298
Area (Acreage)				
2004 Baseline	9,603	3,787	1,405	1,501

Sources: U.S. Census Bureau, 2000 Census. Landrum & Brown Analysis, 2005.

B.3.3.2 Future 2005 and 2010 Noise Impacts

Exhibit B.7 displays the noise exposure contours for the 2005 No Action and 2005 Proposed Action conditions. Areas of increased noise exposure are highlighted on the exhibit as well. **Exhibit B.8** provides a detailed view of the 3.0 dB increase within the 60 DNL area as well as the 5.0 dB increases within the 45 DNL areas. Similarly, **Exhibits B.9 and B.10** display the noise exposure contours for the 2010 No Action and 2010 Proposed Actions conditions, as well as the areas of increased noise exposure. **Table B.8** summarizes the number of people and acres within the increased noise areas for 2005 and 2010 (Proposed Action) conditions.

Table B.8
AREAS OF INCREASE FOR PROPOSED ACTION

Condition	1.5 dB Increase within 65 DNL	3.0 dB Increase within 60-65 DNL	5.0 dB Increase within 45-60 DNL
Population			
2005 Proposed Action	0	177	73,468
2010 Proposed Action	0	196	73,035
Area (Acreage)			
2005 Proposed Action	0	182	12,650
2010 Proposed Action	0	202	12,690

Source: Landrum & Brown, 2005

<u>1.5 dB Increases</u>

There were no areas of +1.5 dB change within the 65 DNL noise exposure resulting from the proposed project for 2005 or 2010 conditions.

<u>3.0 dB Increases</u>

One area along the extended centerlines and west of Runways 7/25 would be exposed to noise increases of 3.0 dB or more within the 60 DNL contour for both the 2005 and 2010, Proposed Action condition. This area would experience an increase in noise exposure under the Proposed Action conditions because the departure routes from Runways 25R/L (going to eastern destinations) would now turn right and proceed around the airport to the north rather than to the south as they currently do. In both the 2005 and 2010 Proposed Action condition, the 3.0 dB increases within the 60 DNL would occur over mostly residential areas west of the airport.

FAA policy based on the FICON findings indicates that a 3.0 dB increase in noise within the 60 DNL areas should be considered for mitigation when a 1.5 dB noise increase is found within the 65 DNL noise level areas. Since this trigger was not found for this project, the 3.0 dB increase area is provided for informational purposes only. Consequently, no mitigation measures would be required for the Proposed Action, because this impact is not considered a significant impact.

<u>5.0 dB Increases</u>

There are two areas of 5 dB increases between the 45 and 60 DNL contours found around the airport resulting from the new procedure. The locations to the west/northwest result from the same relocated flight routes as described above for the 3.0 dB increase area. Again, these areas of change are only considered to be *slight to moderate* in nature and do not represent a significant impact. The areas are disclosed here for informational purposes only.

B.3.3.3 Additional Noise Impacts

In addition to the noise contour analysis presented above, the INM was used to develop a grid point analysis at selected locations throughout the Study Area. The locations used included the noise measurement sites (coded S1 thru S8 and M6, M7) as well as a number of selected grid locations (coded D1 thru D9) along the Proposed Action route. The analysis evaluated DNL levels as well as the Time Above 65 dB (TA65) levels at each location. The TA65 metric presents the estimated number of minutes that outdoor noise levels would be above 65 dB on the average day due to aircraft noise. The 65 dB level provides a rough approximation of a noise level that may cause speech interference in an outdoor setting. The analysis also presents a range of typical aircraft altitudes that would be expect for flights near each grid point location.

For the No Action scenario, a close-in view of the existing STAAV 2 departure procedure is shown in **Exhibit B.11** and the existing departure flight paths modeled for departures on Runways 25L and 25R are shown in **Exhibit B.12**. For the Proposed Action scenario, a close-in view of the proposed STAAV 3 departure procedure is shown in **Exhibit B.13** and the proposed departure flight paths modeled for departures on Runways 25L and 25R are shown in **Exhibit B.14**.

As shown in **Exhibits B.12 and B.14**, specific grid point locations under the existing (No Action) and proposed departure paths (Proposed Action) are identified with a code and values for DNL, number of operations, and the typical average altitude of aircraft on the route above that location. The altitude range represents the range of altitudes Above Ground Level that most departures near the grid point will fall within. The DNL values and Daily Operations values present the expected noise levels and daily number of flights over each site for the 2005 condition.

Table B.9 presents a summary of the average daily operations and typical altitude ranges expected in 2005 near each grid point for both the No Action and Proposed Action scenarios. As the table indicates, the sites southwest and south of the airport (D5-7, M6-7) are expected to experience about 10% to 50% fewer overflights resulting from the Proposed Action depending on location. The typical range of altitudes for aircraft passing near these sites is expected to remain similar to what is currently experienced. Sites to the northwest and north of the airport are expected to experience substantially more overflights on the average day resulting from the Proposed Action than they do today. For most of these sites; however, the typical altitudes of the aircraft passing near the site is expected to increase as a result of the Proposed Action.

Table B.9
DAILY OPERATIONS AND TYPICAL ALTITUDES AT SPECIFIC LOCATIONS UNDER FLIGHT PATHS

Location	Daily Operations		Typical Aircraft Altitude Range(AGL)	
	No Action	Proposed Action	No Action	Proposed Action
D1	2	127	3,005 - 3,005	2,005 - 4,005
D2	2	127	5,200 - 6,200	5,200 - 6,200
D3	1	127	6,665 - 7,165	7,165 - 13,165
D4	14	127	12,350 - 13,350	9,350 - 17,350
D5	332	220	3,550 - 5,550	3,550 - 5,550
D6	214	101	6,810 - 8,310	6,810 - 8,810
D7	112	101	10,860 - 12,360	10,360 - 12,360
D8	14	127	8,624 – 18,124	8,124 – 19,124
D9	28	127	16,197 – 20,697	16,697 – 26,697
M6	332	220	2,360 - 3,360	2,860 - 3,860
M7	332	220	2,370 - 3,370	2,870 - 3,870
S1	1	127	6,700 - 7,200	7,200 - 13,200
S2	15	127	5,700 - 8,700	7,200 - 13,200
S3	15	127	4,492 - 7,492	5,992 - 11,992
S4	14	127	3,425 - 4,225	3,425 - 6,425
S5	14	127	4,075 - 5,575	5,575 - 8,575
S6	14	127	3,970 - 5,470	4,470 - 7,470
S7	14	127	5,340 - 6,840	5,840 - 9,840
S8	1	127	7,000 - 7,200	6,000 - 14,000

Note: AGL refers to Above Ground Level
Source: Landrum & Brown, 2005.

Table B.10 presents a comparison of the No Action and Proposed Action DNL and TA65 values at the grid points for 2005 and 2010. The comparison generally indicates that the DNL noise levels increase slightly north of the airport under the new procedure while decreases are evident south of the airport. A similar pattern of change is noted for both the 2005 and 2010 conditions. The comparison of TA 65 values at the grid points indicates that, under the No Action condition, the time above 65 dB in 2005 ranges from 0 to 35 minutes on the average day with an average of 6 minutes across all of the grid points. In comparison, the range of TA65 values for the 2005 Proposed Action condition goes from 0 to 23 minutes, wit an average of 5.9 minutes among all grid points evaluated. Again, the sites northwest and north of the airport tend to experience slight increases in TA65, while those situated to the south experience reductions in TA65. The trends in TA65 are similar for the 2010 conditions as presented in the table.

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Table B.10
NOISE LEVELS AT SPECIFIC LOCATIONS UNDER FLIGHT PATHS

Location	2005						2010					
	No Action		Proposed Action		Change		No Action		Proposed Action		Change	
	DNL	TA65	DNL	TA65	DNL	TA65	DNL	TA65	DNL	TA65	DNL	TA65
D1	52.5	3.4	59.1	20.4	6.6	17.0	52.7	3.6	59.2	22.4	6.5	18.8
D2	47.2	0.3	51.3	1.5	4.1	1.2	47.6	0.3	51.7	1.2	4.1	0.9
D3	38.5	0.1	43.3	0.3	4.8	0.2	38.8	0.1	43.1	0.2	4.3	0.1
D4	28.8	0.0	30.7	0.0	1.9	0.0	29.2	0.0	30.2	0.0	1.0	0.0
D5	57.7	13.4	56.7	10.5	-1.0	-2.9	57.9	13.1	56.8	10.3	-1.1	-2.8
D6	48.9	2.3	47.3	1.4	-1.6	-0.9	49.0	2.2	47.4	1.3	-1.6	-0.9
D7	39.3	0.1	38.8	0.1	-0.5	0.0	39.6	0.1	39.3	0.1	-0.3	0.0
D8	23.1	0.0	23.0	0.0	-0.1	0.0	23.8	0.0	23.8	0.0	0.0	0.0
D9	28.4	0.0	28.4	0.0	0.0	0.0	29.1	0.0	29.1	0.0	0.0	0.0
M6	59.4	28.9	58.2	18.6	-1.2	-10.3	59.6	31.7	58.4	20.3	-1.2	-11.4
M7	61.0	35.1	59.7	23.1	-1.3	-12.0	61.1	38.7	59.8	25.5	-1.3	-13.2
S1	44.2	0.1	44.6	0.2	0.4	0.1	44.4	0.1	44.6	0.2	0.2	0.1
S2	51.1	3.4	49.8	3.2	-1.3	-0.2	51.5	3.8	50.3	3.6	-1.2	-0.2
S3	56.8	16.5	56.4	16.1	-0.4	-0.4	57.0	18.1	56.6	17.8	-0.4	-0.3
S4	47.6	1.3	53.6	4.7	6.0	3.4	47.8	1.3	53.8	4.5	6.0	3.2
S5	50.6	2.4	53.1	3.7	2.5	1.3	50.9	2.5	53.4	3.7	2.5	1.2
S6	45.6	0.9	50.9	2.4	5.3	1.5	45.9	0.8	51.1	2.1	5.2	1.3
S7	53.2	6.6	53.4	6.7	0.2	0.1	53.6	7.4	53.7	7.5	0.1	0.1
S8	33.6	0.0	36.3	0.1	2.7	0.1	33.8	0.0	35.5	0.1	1.7	0.1

Source: Landrum & Brown, 2005.

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B.3.3.4 Cumulative Noise Considerations

In addition to modeled aircraft noise levels associated with the airport of interest, it is often helpful to consider the effects of a proposed action in the context of other noise sources in the area. To that end, the following sub-section presents a quantitative evaluation of the background noise at select locations within the Study Area based on a sample of field noise measurements. This analysis is followed by a qualitative evaluation of the potential noise contributions from the two airports situated just north of LAS near the area where the proposed procedure will be flown. Both of these evaluations consider the modeled noise changes associated with the Proposed Action in the context of the other noise sources and levels in the area. Thus, an additional perspective is provided for the consideration of the modeled noise values detailed in the earlier sections of this report.

<u>Background Noise Comparison</u>

In addition to the noise modeling analysis presented in the previous section, the noise measurement data presented in earlier in this report was analyzed in conjunction with the noise modeling computations for each of the 10 unique noise measurement sites in the Study Area. This analysis was conducted in order to provide a general understanding of the effects of the proposed project alternative at each location. By including the measured noise along with the modeled changes for each alternative, an estimation of each alternative's contribution to the total noise picture at each site is possible. Accordingly, aircraft noise from modeled aircraft operations, as well as **all other aircraft operations** can be considered. While this type of analysis can only be done specific to each noise measurement location, it does provide some insights as to the project alternatives contribution to the total noise in the area.

The noise levels measured at each of the 10 noise measurement sites contains contributions from all noise sources, including both aircraft and non-aircraft noise events. As previously described, noise events associated with aircraft overflights from LAS at each site were subtracted out of the total noise recorded at each site and an average noise value was computed for the measurement period. This resulting value represents an estimation of the background noise at each site including various local noise sources which may include other aircraft activity that was not included in the INM modeling. This might include VFR flights traversing the area or traffic from other airports in the Las Vegas area. For the purposes of this analysis, these computed background noise levels were assumed to be reasonable estimations of the future background noise levels that might be found at each site in 2005 and 2010.

These "Background" noise values were then added to the future INM modeled noise levels (representing IFR aircraft only) to create an estimated "Total" noise level for each site. This was done for the No Action as well as the proposed action alternative for each future year. **Table B.11** presents the results of this computation along with the measured background DNL values at each site.

Table B.11
COMPARISON OF TOTAL DNL NOISE VALUES AT MEASUREMENT SITES

		2005 Total Noise (background + modeled)		2010 Total Noise (background + modeled)	
Measurement Site	**Measured Background Noise**	**No Action**	**Proposed Action**	**No Action**	**Proposed Action**
Site 1	51.2	52.0	52.1	52.0	52.1
Site 2	58.1	58.9	58.7	59.0	58.8
Site 3	53.3	58.4	58.1	58.5	58.3
Site 4	52.7	53.9	56.2	53.9	56.3
Site 5	48.6	52.7	54.4	52.9	54.6
Site 6	49.4	50.9	53.2	51.0	53.3
Site 7a	51.0	55.2	55.4	55.5	55.6
Site 8	62.8	62.8	62.8	62.8	62.8
SiteM6	59.5	62.5	61.9	62.6	62.0
Site M7	60.0	63.5	62.9	63.6	62.9

Source: Landrum & Brown analysis, 2005

In order to investigate the changes associated with the Proposed Action alternative when all noise sources are considered, the No Action total noise levels are subtracted from the total noise levels associated with the Proposed Action in each year. **Table B.12** presents the estimated differences in total noise at each site for the Proposed Action in each of the future years and compares the results to the change computed form the INM modeling where only LAS aircraft noise is considered.

Table B.12
DIFFERENCE IN TOTAL NOISE FOR PROJECT ALTERNATIVES AT MEASUREMENT SITES

Measurement Site	2005 Change Comparison		2010 Change Comparison	
	Modeled Change	Total Noise Change	Modeled Change	Total Noise Change
Site 1a	0.4	0.1	0.2	0.0
Site 2	-1.3	-0.2	-1.2	-0.2
Site 3	-0.4	-0.3	-0.4	-0.3
Site 4	6.0	2.3	6.0	2.4
Site 5	2.5	1.7	2.5	1.7
Site 6	5.3	2.3	5.2	2.3
Site 7	0.2	0.1	0.1	0.1
Site 8	2.7	0.0	1.7	0.0
Site M6	-1.2	-0.6	-1.2	-0.6
Site M7	-1.3	-0.7	-1.3	-0.7

Source: Landrum & Brown analysis, 2005.

As the table indicates, when total noise is considered, the change in noise levels associated with the Proposed Action are notably smaller than those revealed from noise modeling alone. This is expected since the total noise picture at most of the sites is not dominated by aircraft noise alone. Overall, the analysis confirms that the noise changes associated with the Proposed Action tend to be very small in the context of the total noise picture for locations that are not situated very the airport. Thus, the noise modeling analysis generally presents a reliable, if not conservative, understanding of the changes in noise to be expected with the Proposed Action.

<u>Other Airport Considerations</u>

Although the Proposed Action procedure evaluated in this SEA would only affect portions of the traffic departing Runways 25L/R from LAS, the proximity of other airports in the area may be a concern to nearby residents when considering the overall noise effects of the project. Since both North Las Vega Airport (VGT) and Nellis Air Force Base (LSV) are located north of LAS, near the area where the Proposed Action procedure will be flown, a qualitative assessment of the potential cumulative noise effects from these two facilities was undertaken.

When considering the noise effects associated with VGT and LSV, it is important to note that the noise generated by traffic from these facilities would be the same in both the future No Action and Proposed Action conditions. In cases such as this, the noise from the outlying facilities often serves to mask the change associated with the project at the airport of interest. This phenomenon was illustrated in the quantitative analysis regarding background noise presented in the previous section. Although the background noise measurement samples evaluated in that analysis were of a relatively short duration, they did include aircraft aft noise from traffic at both VGT and LSV. Despite this fact, further evaluation was developed.

In order to develop a qualitative understanding to the potential noise contributions associated with traffic at VGT and LSV, some quantitative noise estimations were developed. This was done by reviewing the most recently published noise contour maps for each facility. The North Las Vegas Airport recently completed an Environmental Assessment for the construction of an Instrument Landing System (ILS) for Runway 12L in September 2003. Similarly, The Department of the Air Force published an Air Installation Compatible Use Zone (AICUZ) report for Nellis Air Force Base in September, 2004. Both of these documents presented aircraft noise contour mapping associated with the air traffic at each facility.

Using some numeric analysis in conjunction with professional judgment, the noise patterns associated with each airport were extrapolated to the grid points northwest and north of LAS that were evaluated in the detailed LAS noise modeling. These estimated noise levels from VGT and LSV were then added to the modeled noise levels from LAS for both the No Action and Proposed Action scenarios to form an estimated total aircraft noise value. The differences between the No Action total aircraft noise values and the Proposed Action total aircraft noise values were then compared to the differences found from the LAS noise modeling alone.

In general, the comparison revealed that the noise from VGT and LSV would tend to mask the changes associated with the Proposed Action at LAS. In cases where the VGT and LSV noise combined with the LAS noise to approach a threshold level of interest (45 DNL in this case); the change in total aircraft noise resulting from the Proposed Action was totally masked by the noise from the other airports. Consequently, it is reasonable to conclude that the noise modeling results presented for the LAS traffic provides a reliable, if not conservative, evaluation of the noise changes that would be associated with the Proposed Action.